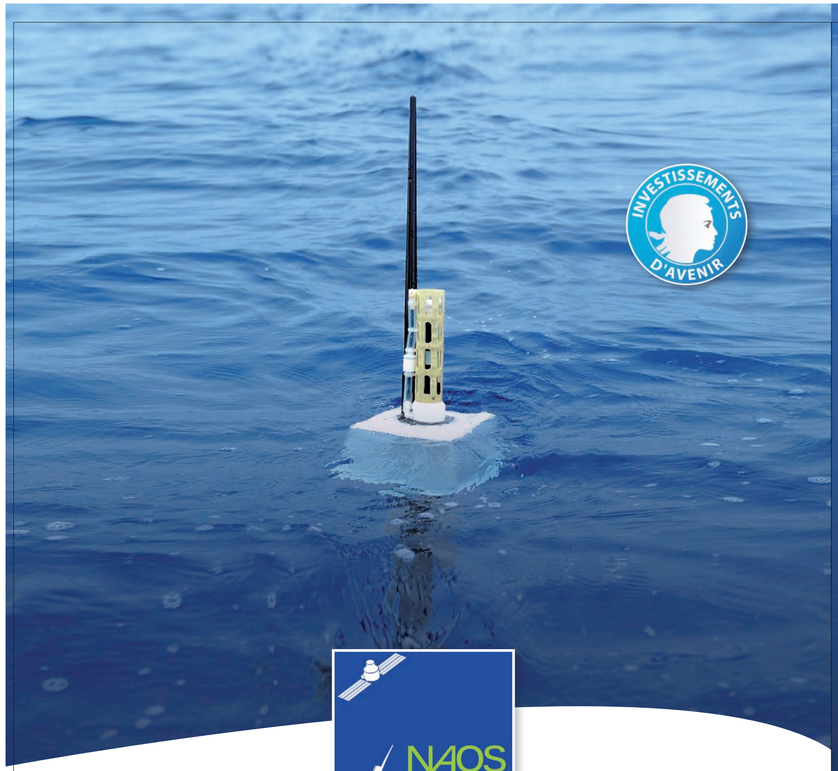


INVESTISSEMENTS D'AVENIR

NAOS
Novel Argo Ocean observing System

www.naos-equipex.fr

naos@ifremer.fr

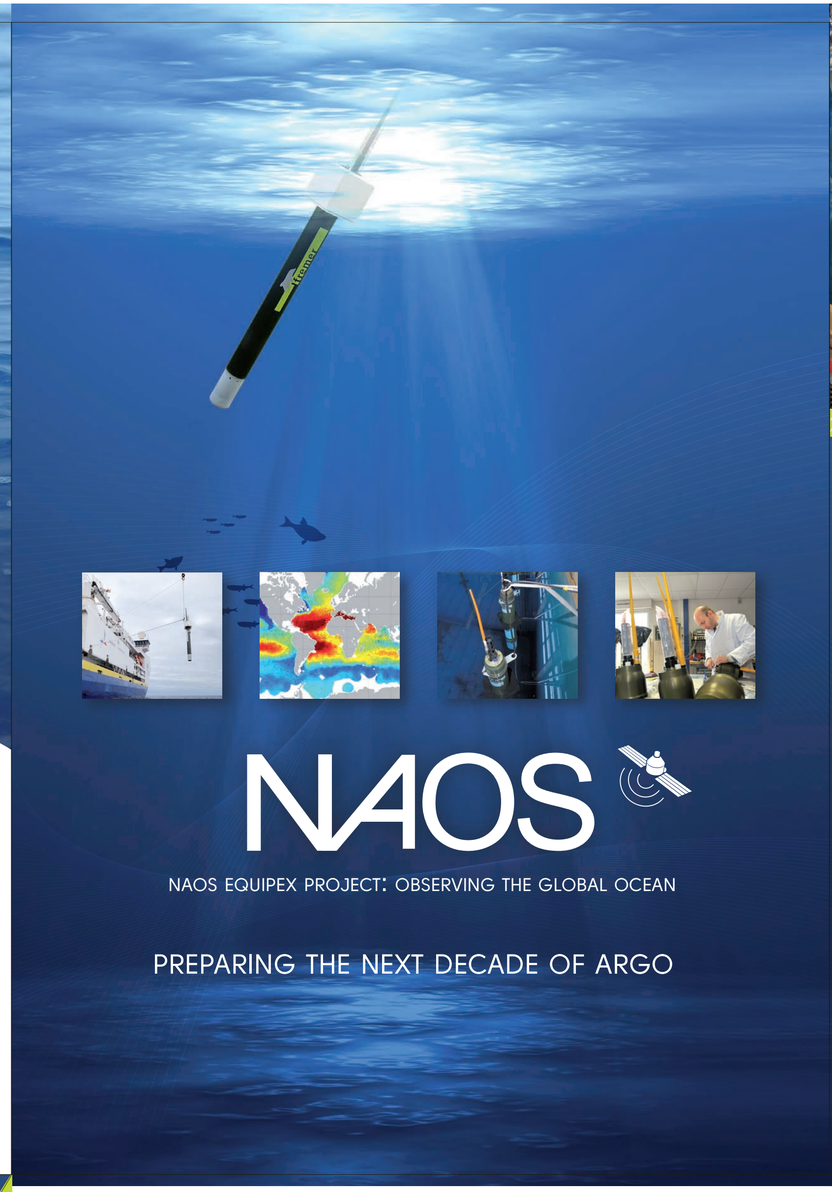
Coordinator : Ifremer - P.Y. Le Traon : pierre.yves.le.traon@ifremer.fr

084034 - hippocampe. com

Ifremer UPMC SORBONNE UNIVERSITÉS cnrs ueb nke ELECTRONICS CLS

ANR convention # : ANR-10-EXPQ-40

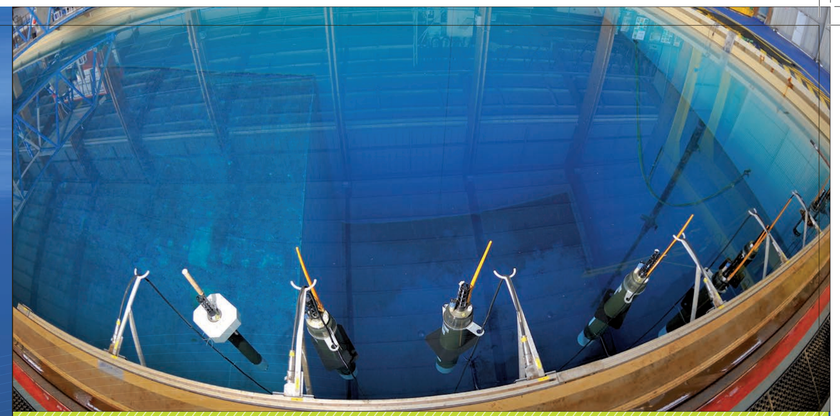
www.naos-equipex.fr

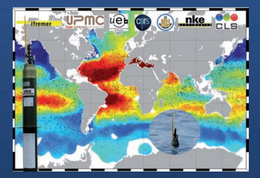


NAOS

NAOS EQUIPEX PROJECT: OBSERVING THE GLOBAL OCEAN

PREPARING THE NEXT DECADE OF ARGO





NAOS IS ONE OF THE MAJOR PROJECTS SELECTED AS PART OF THE EQUIPEX CALL FOR PROPOSALS FROM THE FRENCH PROGRAMME *INVESTISSEMENTS D'AVENIR.*

OBJECTIVE

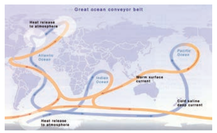
To consolidate and improve the French and European contribution to the international Argo observing system and to prepare the next decade of Argo.

CHALLENGE

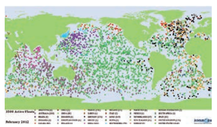
To set up an effective monitoring of the world ocean and to strengthen French leadership in ocean and climate research and prediction.

SOCIO-ECONOMIC IMPACTS

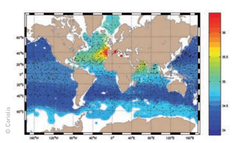
Given the prominent role of Argo for climate change research, impacts are expected to be large on the longer run. NAOS will also directly contribute to the development of the economic sector through the partnership with NKE. NKE objective is to expand by at least a factor two its Argo float market shares in Europe and worldwide.



The oceanic circulation, the great ocean conveyor belt which regulates the planet's climate



European contribution to the international Argo



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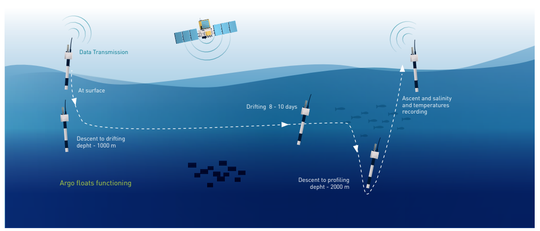
Map of salinity at 1000 m depth derived from Argo observations



WHY OBSERVING THE OCEANS ?
OCEAN AND CLIMATE

The oceans store, transport and exchange with the atmosphere large amounts of heat, water and gases. These exchanges dramatically affect world and regional climates.

Long term, global and high quality ocean observations are thus needed to understand the role of the ocean on the earth's climate and to predict the evolution of our weather and climate.

GLOBAL OCEAN OBSERVATION:
THE ARGO REVOLUTION

The objective of the Argo program is to deploy a global array of 3,000 autonomous profiling floats measuring in real time and every 10 days temperature and salinity throughout the deep global oceans, down to 2,000 meters. End of 2007, the project reached his initial target of 3,000 profiling floats operating worldwide. Argo is now the major and only systematic source of information and data over the ocean's interior. It provides essential data for ocean and climate change research.

Argo results from an outstanding international cooperation. More than 30 countries are involved in the development and maintenance of the array. The instruments are battery powered, with an average life time of 4 years. Maintaining the array requires deploying every year between 800 and 900 new floats.

Argo aims to establish a global array of in situ measurements integrated with other elements of the climate observing system (in particular satellite observations) to:

- detect climate variability from seasonal to decadal scales and provide long-term observations of climate change in the oceans,
- provide essential data to constrain global and regional ocean analysis and forecasting models, to initialize seasonal and decadal forecasting ocean/atmosphere coupled models and to validate climate models,
- provide information necessary for the calibration and validation of satellite data.

THE FRENCH CONTRIBUTION TO ARGO

France is very active in all components of Argo: float technology development, contribution to the global array, data centers, research and operational oceanography, marine biogeochemistry extension. France also coordinates the European contribution to Argo (Euro-Argo).

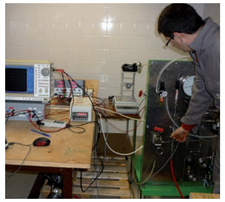
NAOS:
THE EQUIPEX PROJECT

THE PROJECT HAS TWO MAIN OBJECTIVES

- To consolidate the French contribution to the Argo core mission (global temperature and salinity measurements down to 2,000 m) by deploying 10 to 15 additional floats per year from 2012 to 2019 (total 110 floats). The French contribution to Argo and Euro-Argo should thus reach 70 to 80 floats per year.
- To develop and validate the next generation of Argo profiling floats. New float capabilities will include: improved performances, integration of biogeochemical sensors, deeper measurements (3,500 m) and under-ice operations in the polar seas. 70 new generation floats will be deployed in three pilot areas: Mediterranean, Arctic and North Atlantic.

NAOS: THE NEW GENERATION OF ARGO FLOATS

- Improved reliability and lifetime, reduction of costs.
- Evaluation of an optical density sensor as an alternative for conductivity sensor for salinity measurements.
- New satellite communications (Argos-3, Iridium) : to transmit more information, to remotely pilot the float and reprogram it.
- Design of a new electronics to manage the increasing number of sensors that profiling floats will carry. Development of an "intelligent float" where science measurements can decide on float actions.
- Deep ocean observation with 3,500 m profiling depth capability.
- New capacities to study biogeochemistry by adding new sensors (oxygen concentration, chlorophyll a concentration, nitrate concentration and particulate organic carbon).
- Under-ice measurements. Development of acoustic or optic passive/active sensors for ice detection. When ice is detected, float ascent is aborted, data are stored and satellite transmission is postponed up to the next cycle.



PARTNERSHIP

NAOS results from a strong partnership between IFREMER (coordinator), UPMC (co-coordinator), CNRS, UBO/IUEM (PRES UEB), SHOM, and two private companies: CLS for satellite telecommunication aspects and the NKE SME which is in charge of the industrialization and commercialization of French Argo floats.

NAOS benefits from a state aid from the French programme *"Investissements d'avenir"*. This aid is managed by ANR, the French National Research Agency (reference: ANR-10-EQPX-40).

DETAILS OF ACTIVITIES

The project started on June 1st, 2011 and will end on December, 31st 2019. The total budget is 8 M€. 6 M€ will be dedicated to the development phase and the procurement of float series. 2 M€ will be used to support science investigations.

The project is structured into 5 main workpackages:

WP1: Consolidation of the French contribution to Argo (Lead: Ifremer).

WP2: Development of the next generation of French Argo floats (Lead: Ifremer).

WP3: Biogeochemical floats in the Mediterranean Sea (Lead: UPMC/LOV).

WP4: Biogeochemical floats in the Arctic Sea (Lead: CNRS/UMI Takuvik).

WP5: Deep oxygen floats in the North Atlantic (Lead: UBO/IUEM/LPO).

Prototypes will be developed and tested in WP2 from June 2011 to June 2014.

Floats series will be procured for WP1, 3, 4 and 5 from January 2012 to January 2016.